
DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention is applicable to the recording and reproducing device of a compact disk and a compact disk, concerning the transmission equipment of a digital signal, the transmission method of a digital signal, and the recording medium of a digital signal. In this invention, a digital signal is operated and transmitted so that quality may deteriorate, and so that the quality which deteriorated by predetermined processing can be recovered, to such an extent that it can perceive.

Therefore, digital audio signals can be transmitted also to a conventional machine machine, and it enables it to protect copyright effectively.

[0002]

[Description of the Prior Art]Conventionally, in digital audio equipment, such as a compact disc player, it is made as [protect / by SCMS (Serial Copy Management System) / copyright].

[0003]namely, -- carrying out binary identification of the regenerative signal acquired by a compact disc player irradiating a compact disk with a laser beam, and obtaining regenerative data -- this regenerative data -- an EFM recovery and error correction processing -- DEINTA reeve processing is carried out and digital audio signals are played. As opposed to a compact disc player carrying out digital to analog conversion of these digital audio signals, and outputting them to the audio equipment of an analog signal input, To digital audio equipment etc., these digital audio signals are outputted by predetermined format. In this format, a compact disc player sets up the code which shows copy prohibition, the copy permission restricted at once, and unrestricted copy permission, and is made as [protect / reflecting an owner's of a copyright intention / this / copyright].

[0004]

[Problem(s) to be Solved by the Invention]By the way, even when adding such a code and outputting digital audio signals, in the apparatus which disregards this kind of code and operates, it may be indefinitely copied against an owner's of a copyright intention.

[0005]How to carry out scramble processing of the digital audio signals, and to transmit them as one method of solving this problem can be considered. In the case of this method, it is thought that various works can be protected according to an owner's of a copyright intention, for example by transfer of key data required for descrambling processing.

[0006]However, when it does in this way, to the conventional audio equipment, there is a problem it becomes impossible to transmit digital audio signals.

[0007]This invention tends to propose the transmission equipment of a digital signal which was made in consideration of the above point, and can transmit a digital signal also to a conventional machine machine, and can protect copyright effectively, the transmission method of a digital signal, and the recording medium of a digital signal.

[0008]

[Means for Solving the Problem]In [in order to solve this technical problem] this invention, Quality of an input digital signal is degraded, a digital signal of quality degradation is generated,

and a digital signal of this quality degradation is transmitted so that it may apply to transmission equipment of a digital signal, or a transmission method of a digital signal and degradation of quality can be perceived, and so that quality which deteriorated can be recovered.

[0009]A digital signal with which quality deteriorates is inputted so that quality which deteriorated can be recovered, and quality of this digital signal is recovered so that it may apply to transmission equipment of a digital signal, or a transmission method of a digital signal and degradation of quality can be perceived.

[0010]A digital signal of this quality degradation is recorded about a digital signal of quality degradation which deteriorates quality so that quality which deteriorated can be recovered so that it may apply to a recording medium of a digital signal and degradation of quality can be perceived.

[0011]So that it may apply to transmission equipment of a digital signal, or a transmission method of a digital signal and degradation of quality can be perceived, And if quality of an input digital signal is degraded, a digital signal of quality degradation is generated so that quality which deteriorated can be recovered, and a digital signal of this quality degradation is transmitted, it can use also in apparatus which processes a transmitted digital signal directly. It enables this to transmit a digital signal also to a conventional machine machine. When protection of copyright which carries out the similar copy of this digital signal at this time is doubtful, a digital signal will be copied by quality which deteriorated and, thereby, protection of copyright is achieved. On the other hand, in a digital signal of this quality degradation, when quality has deteriorated so that recovery is possible, it becomes possible to provide a quality digital signal by recovering quality for copyright in apparatus which can be protected certainly, and processing a digital signal.

[0012]By applying to transmission equipment of a digital signal, or a transmission method of a digital signal, inputting a digital signal with which quality deteriorated, and recovering quality of this digital signal, In perfect apparatus, protection of copyright becomes possible [processing a quality digital signal], holding compatibility between conventional machine machines.

[0013]So that it may apply to a recording medium of a digital signal and quality can also perceive degradation, And if a digital signal which makes quality come to deteriorate is recorded so that quality which deteriorated can be recovered, when transmitting a digital signal via a recording medium, a digital signal can be transmitted also to a conventional machine machine, and copyright can be protected effectively.

[0014]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is explained in full detail, referring to drawings suitably.

[0015](1) The 1st embodiment drawing 1 is a block diagram showing the optical disk recording device used for manufacture of a compact disk. In this 1st embodiment, after developing the disk original recording 2 exposed by this optical disk recording device 1, the Mother disk is created by carrying out an electroforming process. Furthermore, a compact disk is created using this Mother disk.

[0016]Thus, the disk original recording 2 by which exposing treatment is carried out applies a sensitizing agent to a flat glass substrate, and is formed, for example. The spindle motor 3 rotates this disk original recording 2 by control of the spindle servo circuit 4. At this time, the spindle motor 3 outputs FG signal FG to which a signal level rises for every predetermined angle of rotation with the FG signal generator formed in the pars basilaris ossis occipitalis. The spindle servo circuit 4 drives the spindle motor 3 so that this FG signal FG may become predetermined

frequency, and thereby, it rotates the disk original recording 2 by the conditions of a constant linear velocity.

[0017]The laser 5 for record is constituted by the gas laser etc., and ejects the laser beam of predetermined light volume. The optical modulator 6 is constituted by the electric acoustooptical device etc., and carries out on-off control of the laser beam L which enters from the laser 5 for record according to the driving signal S3.

[0018]The mirror 8 bends the optical path of the laser beam L, and ejects it towards the disk original recording 2. The object lens 9 condenses the catoptric light of this mirror 8 to the recording surface of the disk original recording 2. The mirror 8 and the object lens 9 are made as [move / radially / the disk original recording 2 / synchronizing with rotation of the disk original recording 2 / according to the thread mechanism which is not illustrated / one by one]. Thereby, the optical disk recording device 1 displaces the condensing position of the laser beam L one by one to the outer peripheral direction of the disk original recording 2, and forms a track ***** on the disk original recording 2. At this time, the pit sequence according to the modulating signal S3 is formed on this track.

[0019]The bit manipulation part 10 receives audio information DA of 16 bit parallels outputted by the predetermined server, and the low rank side of this audio information DA operates 8 bits. The bit manipulation part 10 operates these bits about 8 bits of low ranks here by dividing by 2 bitwises and changing the combination of 2 bits each in accordance with a predetermined rule. That is, as the combination of 2 bits shows to drawing 2, it changes into the combination of logic "11" about the combination of logic "00", and changes into the combination of logic "10" about the combination of logic "01." About logic "10" and the combination of "11", it changes into logic "00" and the combination of "01", respectively.

[0020]Thereby, about the tone quality which is the quality of digital audio signals, the bit manipulation part 10 degrades tone quality to such an extent that it can perceive degradation. Tone quality is degraded so that the tone quality which furthermore deteriorated at this time can be recovered.

[0021]The data processing circuit 11 inputs data DI of TOC recorded on read in area of a compact disk, and processes data DI of this TOC according to the format to which the compact disk was specified. Thereby, the data processing circuit 11 generates and outputs the channel data corresponding to a pit sequence. The data processing circuit 11 processes similarly the digital signal D2 outputted from the bit manipulation part 10 according to the format to which the compact disk was specified, and generates and outputs the channel data corresponding to a pit sequence.

[0022]Thus, disk-identification-data ID which shows that bit manipulation of digital-audio-signals DA is carried out, and the data of TOC to record is recorded, It is made as [assign / copy identification data IC which shows that it is an original compact disk created from the Mother disk]. Thereby by this embodiment, it is made as [reproduce / based on the detection result of this disk-identification-data ID / digital-audio-signals DA by which bit manipulation was carried out] at the time of reproduction. It is made as [judge / based on copy identification data IC / an original compact disk or the copied compact disk].

[0023]The drive circuit 12 receives the channel data D3 which does in this way and is outputted from the data processing circuit 11, and generates the driving signal S3 with which a signal level changes corresponding to the logical level of this channel data D3.

[0024]In this embodiment, about 8 bits of the 16-bit data which constitutes digital-audio-signals DA by this. The low rank side which is recorded on the disk original recording 2 and remains so

that it may play with the usual compact disc player and can play correctly about 8 bits. It is made as [play / in accordance with the conversion rule further mentioned above about drawing 2, bit manipulation of the audio information played with the usual compact disk is carried out, and / it / correctly].

[0025]It is called an ECD disk when the compact disk manufactured by the optical disk recording device 1 of this drawing 1 is hereafter shown in distinction from the compact disk from the former.

[0026]Drawing 3 is a block diagram showing a compact disc player, and plays the compact disk from the former, and an ECD disk. That is, in this compact disc player 20, the compact disk 21 is rotated by the conditions of a constant linear velocity with the spindle motor 22 on the basis of regenerative-signal RF obtained from the optical pickup 23.

[0027]RF circuit 24 amplifies and outputs regenerative-signal RF obtained from the optical pickup 23 on a predetermined profit, and the EFM (eight to fourteen) demodulator circuit 25 carries out binary identification of the regenerative signal outputted from RF circuit 24, and generates regenerative data. Furthermore, the EFM demodulator circuit 25 carries out an EFM recovery, and outputs this regenerative data.

[0028]The CIRC decoder 26 carries out descrambling processing of this EFM demodulator circuit 25, and error correction processing of it is carried out with the error correcting code added at the time of record, and, thereby, it reproduces and outputs the digital audio signals D4. it writes -- in the compact disc player 20 in carrying out, As opposed to the compact disk 21 being outputted by the high-quality sound in which these digital audio signals D4 are 16 bits in the case of the compact disk from the former, When the compact disk 21 is an ECD disk, while it is these 16 bits, as for a low rank side, bit manipulation of the 8 bits is carried out, and that part tone quality will deteriorate and will be outputted.

[0029]As for the bit manipulation part 28, the low rank side of the digital audio signals D4 carries out bit manipulation of the 8 bits so that the conversion rule mentioned above about drawing 2 may be followed conversely. Thereby, the bit manipulation part 28 recovers and outputs the tone quality of the digital audio signals D4 which deteriorated, when the compact disk 21 is an ECD disk.

[0030]The disk discrimination part 29 is constituted by the system controller. If loaded with the compact disk 21, a system controller will make the optical pickup 23 seek, will acquire the information, including the number of music, performance time, etc., recorded on the compact disk 21 from read in area of the compact disk 21, and will display it by a predetermined displaying means here. At this time, a system controller is combined, disk-identification-data ID of the compact disk 21 is acquired, and the compact disk 21 judges the compact disk or ECD disk from the former according to this disk-identification-data ID. The disk discrimination part 29 carries out switching control of the point of contact of the selection circuitry 30 based on this decision result.

[0031]The disk discrimination part 29 judges whether the compact disk 21 is a compact disk by a copy based on copy identification data IC acquired similarly. For example by computer, the compact disk by such a copy dubs the contents recorded on the original compact disk to CD-ROM, and is created here. The disk discrimination part 29 is made as [stop / the output of digital audio signals], when operation of the switching circuit 34 is switched based on this decision result and the compact disk 21 is based on a copy by this.

[0032]The compact disk 21 the selection circuitry 30 In the case of the compact disk from the former. As opposed to carrying out the selected output of the digital audio signals D4 outputted

from the CIRC decoder 26 to the digital-to-analog-conversion circuit (D/A) 31, When the compact disk 21 is an ECD disk, the selected output of the digital audio signals with which it comes to recover the tone quality outputted from the bit manipulation part 28 is carried out. [0033]The digital-to-analog-conversion circuit 31 carries out digital-to-analog-conversion processing of the digital audio signals outputted from this selection circuitry 30, and outputs audio signal SA by an analog signal. In the compact disc player 20 by this, As shown in drawing 4, in the quality of a reproduced sound by an analog signal, it is made as [play / by the high-quality sound of 16 bits (shown as CD tone quality) / it / the case of the compact disk from the former, or in the case of an ECD disk]. In this drawing 4, the compact disc player from the former is shown as a CD player by using the compact disk 21 of composition of being shown in this drawing 3 as an ECD player. The compact disk from the former is shown as a CD disk, and the tone quality which deteriorated by bit manipulation is shown as FM tone quality.

[0034]In the conventional compact disc player, In the case of the compact disk from the former, and an ECD disk, by being outputted without the digital audio signals D4 outputted from the CIRC decoder 26 passing the bit manipulation part 28, it will be outputted by CD tone quality and FM tone quality, respectively.

[0035]The interface (I/F) 32 constitutes the input output circuit which sends and receives various data between external instruments etc., and outputs digital audio signals to a personal computer by the format of SCMS, and sends and receives the various data relevant to digital audio signals.

[0036]Like the disk discrimination part 29, the external instrument discrimination section 33 is constituted by the system controller of this compact disc player 20, and performs predetermined authenticating processing between external instruments via the interface 32. In this authenticating processing, the external instrument discrimination section 33 sends out predetermined data to an external instrument, and it judges whether the computer connected to this interface 32 is apparatus which aims at protection of copyright by the response from the external instrument to this data.

[0037]With the apparatus which aims at protection of copyright in this way here. it being apparatus which has the function to forbid creation of a copy (what is called NI -- it is the next copy) from a copy, for example, like this compact disc player 20, When the compact disk 21 is based on a copy, the apparatus which stops the output of digital audio signals and can prevent record of the digital audio signals by an external instrument is meant. therefore, for example, in creating the compact disk of a copy from the digital audio signals which an external instrument is a personal computer and are outputted from this compact disc player 20, When this personal computer has the function to set up copy identification data IC correctly, it corresponds to the apparatus which aims at protection of copyright. (Contrast with the conventional personal computer (conventional PC) shows drawing 4 as a PC of secondary copy prohibition).

[0038]In the case of the apparatus by which, as for the selection circuitry 35, an external instrument aims at protection of copyright based on the decision result of this external instrument discrimination section 33. When it is not apparatus by which an external instrument aims at protection of copyright to carrying out the selected output of the digital audio signals outputted from the selection circuitry 30, the selected output of the digital-audio-signals S4 outputted from the CIRC decoder 26 is carried out. Thereby, the selection circuitry 35 outputs the digital audio signals by high-quality sound also in the case of an ECD disk, when the compact disk 21 is the conventional compact disk in the case of the apparatus by which an external instrument aims at protection of copyright. On the other hand, it receives outputting the digital audio signals by high-quality sound, when an external instrument is not apparatus which aims at protection of

copyright, and the compact disk 21 is the conventional compact disk, When the compact disk 21 is an ECD disk, digital audio signals are outputted according to the tone quality which deteriorated.

[0039]The switching circuit 34 outputs directly the digital audio signals outputted from this selection circuitry 35 to an external instrument via the interface 32. In the case of the disk according [the compact disk 21] to a copy, at this time, the switching circuit 34 stops the output of these digital audio signals based on the disk decision result by the disk discrimination part 29.

[0040]In the above composition, in the manufacturing process (drawing 1) of a compact disk, tone quality deteriorates to such an extent that bit manipulation of digital-audio-signals DA by 16 bits is carried out and 8 bits can perceive it by this in accordance with a fixed rule in the bit manipulation part 10 in a low rank (drawing 2) side. After digital-audio-signals DA is recorded on the disk original recording 2 like the case where the usual compact disk is created, after that, the Mother disk and La Stampa are created one by one from this disk original recording 2, and it is recorded on a compact disk from this La Stampa. On the other hand, in the compact disk from the former, it will be recorded on a compact disk, without the tone quality of digital audio signals deteriorating in any way.

[0041]Thus, when exposing the disk original recording 2, read in area is formed with the data of TOC outputted by the predetermined server, The compact disk which tone quality was degraded by disk-identification-data ID assigned to the data of this TOC, and was recorded, and the compact disk from the former is set up identifiable. By copy identification data IC similarly assigned to the data of TOC, an original compact disk and the compact disk by a copy is set up identifiable.

[0042]Thus, in the compact disk 21 created, After the regenerative signal detected by the optical pickup 23 was amplified in the compact disc player 20 (drawing 3) in RF circuit 24, get over in the EFM demodulator circuit 25, and regenerative data is generated -- this regenerative data -- descrambling processing -- error correction processing is carried out and the original digital audio signals are outputted.

[0043]In the compact disc player from the former, these digital audio signals D4 that error correction processing is carried out and are outputted from the CIRC decoder 26 will be outputted to an external instrument, and it will be changed and outputted to an analog signal. When this loads the compact disc player from the former with the compact disk from the former, the high-quality sound digital audio signals by 16 bits are directly changed and outputted to an analog signal (drawing 4). On the other hand, when the compact disc player from the former is loaded with an ECD disk, digital audio signals will be outputted by the amount of [in which tone quality deteriorates] about 8 bits.

[0044]In this compact disk, this becomes possible to play also with the conventional compact disc player.

[0045]On the other hand, the digital audio signals outputted from the CIRC decoder 26 in the refreshable compact disc player 20 in this ECD disk are inputted into the bit manipulation part 28, and, as for a low rank side, bit manipulation of the 8 bits is carried out contrary to the time of record here. When the compact disk 21 is an ECD disk by this, the digital audio signals which recover tone quality are outputted.

[0046]In the compact disc player 20, The data of TOC is played a priori from read in area of a compact disk, and the compact disk 21 is judged in the compact disk or ECD disk from the former from disk-identification-data ID assigned to the data of this TOC. The compact disk 21 by this In the case of the compact disk from the former. The digital audio signals D4 outputted

from the CIRC decoder 26 are outputted to an external instrument by the format of SCMS via the selection circuitry 30, the selection circuitry 35, the switching circuit 34, and the interface 32. Furthermore, these digital audio signals D4 will be inputted into the digital-to-analog-conversion circuit 31 via the selection circuitry 30, and will be changed and outputted to an analog signal here.

[0047]when this plays the compact disk from the former, it becomes possible to output the playback result by high-quality sound to an external instrument, and to use for versatility like the case where it plays with the compact disc player from the former. It becomes possible to aim at protection of copyright by SCMS. Thereby in this compact disc player 20, it becomes possible to use the compact disk from the former, without restricting the existing user's right in any way.

[0048]On the other hand, when the compact disk 21 is an ECD disk, the digital audio signals with which it comes to recover tone quality in the bit manipulation part 28 are generated, and these digital audio signals are outputted by an analog signal via the selection circuitry 30 and the digital-to-analog-conversion circuit 31. Thereby, also in an ECD disk, like the compact disk from the former, it can try listening an audio signal by high-quality sound, and, in the case of an analog signal, restricts, and it becomes possible to copy it privately by high-quality sound as usual, and to enjoy oneself.

[0049]On the other hand, by the case where the compact disk 21 is an ECD disk, in outputting digital audio signals to an external instrument, Authenticating processing is performed between external instruments via the interface 32, and an external instrument has it judged like the conventional personal computer whether it is apparatus which disregards the code by SCMS. In the case of the apparatus which an external instrument has it judged by this whether it is apparatus which aims at protection of copyright, and aims at protection of copyright, the digital audio signals which recovered tone quality by the bit manipulation part 28 are outputted to an external instrument via the selection circuitry 30, the selection circuitry 35, the switching circuit 34, and the interface 32.

[0050]Quality digital audio signals are outputted to an external instrument by this, and when this external instrument is apparatus which aims at protection of copyright, an illegal duplicate which creates a copy further from a copy is forbidden.

[0051]On the other hand, by performing the copy by an unrestricted digital signal in this case, when an external instrument is not apparatus which aims at protection of copyright, In the compact disc player 20, the digital audio signals D4 with which the tone quality outputted from the CIRC decoder 26 deteriorates are outputted to an external instrument via the selection circuitry 35, the switching circuit 34, and the interface 32. Like [when there is a possibility that the copy by a digital signal unrestricted in this way may be allowed by this / at the time of repeating a copy with an analog signal], It is made as [employ / efficiently / the strong point of the copy by the digital signal said that tone quality does not deteriorate even if tone quality outputted and copies the deteriorating digital audio signals repeatedly].

[0052]On the other hand, in the copy created by outputting high-quality sound digital audio signals in the external instrument which aims at protection of copyright, By the ability to judge by copy identification data IC recorded on read in area when this kind of compact disc player 20 is loaded, In this compact disc player 20, The output of digital audio signals is stopped by the switching circuit 34, and an unrestricted copy is prevented even when outputting the digital audio signals recorded on the ECD disk by this to an external instrument with high-quality sound digital audio signals.

[0053]By degrading the tone quality of digital audio signals so that degradation of tone quality

can be perceived, and so that the tone quality which carried out recovery degradation can be recovered according to the above composition, and recording these digital audio signals, Also with the conventional compact disc player, it is refreshable and the compact disk which can protect copyright effectively, and the optical disk recording device which creates a compact disk can be obtained.

[0054]By judging an external instrument, recovering tone quality and outputting directly, the digital audio signals which were carried out in this way and recorded, it is refreshable in the conventional compact disk, and the compact disc player which can protect copyright effectively can be obtained.

[0055](2) In the embodiment of ***** of the 2nd operation, an optical disk recording device exposes the disk original recording 2 with the digital audio signals which deteriorate tone quality like the optical disk recording device 1 concerning a 1st embodiment. On the basis of the hour entry by the sub-code added and recorded on digital audio signals, the optical disk recording device which takes for this embodiment at this time is a fixed cycle during a fixed period, and performs processing of the same bit manipulation as a 1st embodiment. The tone quality of digital audio signals is degraded, and it enables it to recover the tone quality which deteriorated by this embodiment, by this, so that degradation can be perceived.

[0056]On the other hand, in a compact disc player, like the compact disc player 20 concerning a 1st embodiment, digital audio signals are played and it outputs to an external instrument from a compact disk. The compact disc player which takes for this embodiment at this time acquires a sub-code from the regenerative data produced by playing a compact disk. Furthermore, a hour entry is acquired from this sub-code, and the tone quality of the digital audio signals reproduced on the basis of this hour entry is recovered.

[0057]According to the composition concerning this 2nd embodiment, the same effect as a 1st embodiment can be acquired by repeating the same bit manipulation as a 1st embodiment with a constant period on the basis of the hour entry assigned to the sub-code. In the hour entry which did in this way and was especially assigned to the sub-code, the sub-code itself has the feature in which it is difficult to copy this by not being added and outputted to digital audio signals. Thereby as compared with a 1st embodiment, an illegal copy can be prevented still more effectively.

[0058](3) In a 3rd embodiment of ***** of the 3rd operation, an optical disk recording device deteriorates the tone quality of digital audio signals like the optical disk recording device 1 concerning a 1st or 2nd embodiment, and exposes the disk original recording 2. The optical disk recording device which takes for this embodiment at this time, By the low rank side of digital audio signals carrying out encryption processing of the 8 bits with techniques, such as public key encryption and DES (Data Encryption Standard), the tone quality of digital audio signals is degraded and disk original recording is exposed. The tone quality of digital audio signals is degraded, and it enables it to recover the tone quality which deteriorated by this embodiment, by this, so that degradation can be perceived.

[0059]On the other hand, in a compact disc player, like the compact disc player 20 concerning a 1st or 2nd embodiment, digital audio signals are played and it outputs to an external instrument from a compact disk. In the compact disc player which takes for this embodiment at this time, the processing corresponding to processing of the encryption in an optical disk recording device recovers the tone quality of digital audio signals.

[0060]According to this 3rd embodiment, even if the low rank side bit of digital audio signals is enciphered and it makes it degrade tone quality, the same effect as a 1st embodiment can be

acquired. By furthermore having enciphered, copyright can be protected powerfully much more.

[0061](4) In the embodiment of ***** of the 4th operation, an optical disk recording device exposes the disk original recording 2 with the digital audio signals which deteriorate tone quality like the optical disk recording device 1 concerning a 1st embodiment.

[0062]That is, an optical disk recording device inputs 18-bit digital audio signals from a server, and generates the 16-bit digital audio signals with which tone quality deteriorated from these 18-bit digital audio signals in a bit manipulation part.

[0063]That is, as shown in drawing 5, as for the bit manipulation part 50, an 8-bit and low rank side decomposes [higher rank side] 18-bit digital audio signals into 10 bits. Furthermore, as for the bit manipulation part 50, this low rank side generates data compression processing or digital audio signals carry out nonlinear quantization processing and according to 8 bits for 10 bits by the data processing circuit 51.

[0064]As for the bit manipulation part 50, an 8-bit and low rank side assigns [low rank side which was carried out in this way and generated / 8-bit digital-audio-signals and higher rank side / higher rank side] 8-bit digital audio signals to 8 bits, respectively, and it generates 16-bit synthetic digital audio signals. 18-bit digital audio signals are changed into 16-bit synthetic digital audio signals, and the tone quality of digital audio signals is degraded, and it enables it to recover the tone quality which deteriorated by this embodiment, by this, so that degradation can be perceived. An optical disk recording device exposes the disk original recording 2 with these synthetic digital audio signals, and creates a compact disk.

[0065]On the other hand, in a compact disc player, like the compact disc player 20 concerning a 1st or 2nd embodiment, digital audio signals are played and it outputs to an external instrument from a compact disk.

[0066]At this time, in a compact disc player, synthetic digital audio signals are played and the tone quality of these synthetic digital audio signals is recovered in a bit manipulation part from the regenerative data obtained from a compact disk. Namely, as shown in drawing 6, in the data processing circuit 53, the bit manipulation part 52 recovers the tone quality of digital audio signals by the data decompression processing or nonlinear inverse quantization processing corresponding to the processing in an optical disk recording device, and outputs it to an external instrument selectively.

[0067]According to a 4th embodiment, even if it makes it degrade the tone quality of digital audio signals by data compression processing or nonlinear quantization processing, the same effect as an above-mentioned embodiment can be acquired. To the external instrument which aims at protection of copyright, digital audio signals can be outputted by high-quality sound further much more by recovering the tone quality which degraded the tone quality of digital audio signals by data compression processing or nonlinear quantization processing, and was degraded further.

[0068](5) In a 5th embodiment of ***** of the 5th operation, an optical disk recording device deteriorates the tone quality of digital audio signals like the optical disk recording device 1 concerning an above-mentioned embodiment, and exposes the disk original recording 2. In the optical disk recording device which takes for this embodiment at this time, the bit manipulation part 55, As shown in drawing 7, in the arithmetic circuit 56, digital signal PN for tone quality degradation by 8 bits which makes a unit the frame of the predetermined number by a sub-code, and repeats it is generated, and the low rank side of the digital audio signals of a digital signal calculates 8 bits. An operation is performed here by the summing processing between corresponding bits, subtraction treatment, or EXCLUSIVE OR operation. The tone quality of

digital audio signals is degraded, and it enables it to recover the tone quality which deteriorated by this embodiment, by this, so that degradation can be perceived. In digital signal PN for these tone quality degradation, it is constituted by the pseudonoise by a PN code, for example.

[0069]Corresponding to this, like the compact disc player concerning an above-mentioned embodiment, regenerative data is obtained, digital audio signals are played from this regenerative data, and it outputs to an external instrument from a compact disk in a compact disc player. The compact disc player which takes for this embodiment at this time generates digital signal PN for tone quality degradation in the bit manipulation part 57 corresponding to the processing in an optical disk recording device. As furthermore shown in drawing 8, by the arithmetic circuit 58, the low rank side of the digital audio signals which reproduced this digital signal PN carries out data processing to 8 bits, and this recovers the tone quality of digital audio signals.

[0070]According to a 5th embodiment, even if data processing of the digital signal and digital audio signals for tone quality degradation is carried out and it makes it degrade the tone quality of digital audio signals, the same effect as an above-mentioned embodiment can be acquired.

[0071](6) In a 6th embodiment of ***** of the 6th operation, an optical disk recording device deteriorates the tone quality of digital audio signals like the optical disk recording device 1 concerning an above-mentioned embodiment, and exposes the disk original recording 2. In the optical disk recording device which takes for this embodiment at this time, as shown in drawing 9, the disk original recording 2 is exposed and a compact disk is created so that recording area AR3 of attached data may be formed between read-out-area AR4 and user's area AR2.

[0072]Furthermore in an optical disk recording device, it sets up with the compact disc player from the former by setting out of TOC recorded on read-in-area AR1 not access recording area AR3 of attached data. The digital signal for tone quality degradation (it is an 8-bit digital signal) which makes a unit the prescribed frame (for example, 98 frames) of digital audio signals, and repeats it periodically is recorded on recording area AR3 of this attached data.

[0073]Furthermore, the low rank side of digital audio signals carries out data processing of the 8 bits to this attached data on the basis of a time code, and the tone quality of digital audio signals is degraded, and it enables it to recover the tone quality which deteriorated so that degradation can be perceived. An optical disk recording device records the digital audio signals with which this tone quality deteriorated on user's area AR2. In the digital signal for these tone quality degradation, it is constituted by the pseudonoise by a PN code, for example.

[0074]Corresponding to this, like the compact disc player concerning an above-mentioned embodiment, regenerative data is obtained, digital audio signals are played from this regenerative data, and it outputs to an external instrument from a compact disk in a compact disc player. At this time, in a compact disc player, if it judges that a compact disk is an ECD disk from the data of TOC, recording area AR3 of attached data will be accessed and the digital signal for tone quality degradation will be acquired. Data processing of the digital audio signals furthermore reproduced on the basis of the time code and the digital signal for tone quality degradation is carried out, and this recovers the tone quality of digital audio signals.

[0075]According to a 6th embodiment, even if a digital signal required in order to recover tone quality is separately recorded on a compact disk and it transmits it, the same effect as an above-mentioned embodiment can be acquired.

[0076](7) In the embodiment of ***** of the 7th operation, an optical disk recording device deteriorates the tone quality of digital audio signals like the optical disk recording device 1 concerning an above-mentioned embodiment, and exposes the disk original recording 2. At this time, as for an optical disk recording device, the low rank side of digital audio signals operates 8

bits, for example with various techniques, such as encryption, and, thereby, it deteriorates and records the tone quality of digital audio signals. Key data required in order to recover the tone quality of these degraded digital audio signals furthermore etc. are recorded between read out area and user data. The tone quality of digital audio signals is degraded, and it enables it to recover the tone quality which deteriorated by this embodiment, by this, so that degradation can be perceived.

[0077]Corresponding to this, like the compact disc player concerning an above-mentioned embodiment, regenerative data is obtained, digital audio signals are played from this regenerative data, and it outputs to an external instrument from a compact disk in a compact disc player. At this time, a compact disc player plays key data required in order to recover the tone quality of digital audio signals from a compact disk a priori, and recovers the tone quality of digital audio signals with this key data.

[0078]According to this 7th embodiment, even if it records separately various kinds of data required in order to degrade tone quality by encryption etc. and to recover this tone quality, the same effect as a 6th above-mentioned embodiment can be acquired.

[0079](8) In the embodiment of ***** of the 8th operation an optical disk recording device, After an 8-bit and low rank side's decomposing [higher rank side] digital audio signals into 8 bits, the frame of digital audio signals is made into a unit, this low rank side replaces 8 bits under a predetermined rule, and the tone quality of digital audio signals is deteriorated. Thereby, an optical disk recording device is replaced with operation of the amplitude direction concerning the embodiment mentioned above, and by operation of a time base direction, degrades the tone quality of digital audio signals so that recovery is [that consciousness is possible and] possible.

An optical disk recording device exposes disk original recording with these digital audio signals. [0080]In the compact disc player applied to this embodiment corresponding to this, An 8-bit and low rank side decomposes [higher rank side] into 8 bits the digital audio signals acquired by playing a compact disk, a low rank side replaces 8 bits corresponding to operation of the time base direction in an optical disk recording device, and this recovers the tone quality of digital audio signals.

[0081]Even if digital audio signals are operated to a time base direction and it makes it degrade tone quality like an 8th embodiment, the same effect as an above-mentioned embodiment can be acquired.

[0082](9) In the embodiment of ***** of the 9th operation, an optical disk recording device exposes the disk original recording 2 with the digital audio signals with which tone quality deteriorated like the optical disk recording device 1 concerning an above-mentioned embodiment.

[0083]At this time, an optical disk recording device processes digital audio signals by the bit manipulation part 61 shown in drawing 10, and digital audio signals are operated so that it may be mostly reproduced with a monophonic recording depending on the compact disc player from the former by this. An optical disk recording device degrades the tone quality of digital audio signals so that it can perceive, and it enables it to recover degradation of this tone quality by this.

[0084]Namely, by inputting the digital audio signals R and L of the right channel by 16 bits each, and a left channel into the arithmetic circuit 62, and performing predetermined data processing between data corresponding here in the bit manipulation part 61, $(R+L)$ 16 bits each and the digital audio signals of two channels which are expressed by $/2$, and $(R-L)/2$ are generated.

[0085]The bit manipulation part 61 assigns and outputs the digital audio signals LM of $/2$ which

is a summed signal among these digital audio signals of two channels (R+L) to the left channel in the conventional compact disk as main digital audio signals.

[0086]Top 8 bits of the digital audio signals expressed by (R-L) of one channel / 2 in which the comparison circuit 63 remains, In the digital audio signals expressed by /2 generated by comparing the predetermined criterion data REF and doing in this way (R-L), according to there being little data volume. It is judged whether in a low rank side, the digital audio signals expressed by this (R-L) / 2 can express by 8 bits.

[0087]The selection circuitry 64 outputs selectively synthetic digital-audio-signals DM and digital-audio-signals R of a right channel based on the comparison result SEL of the comparison circuit 63. As for synthetic digital Audie signal DM, an 8-bit and higher rank side assigns [low rank side of the digital audio signals expressed by (R-L)/2 / higher rank side of 8 bits and the digital audio signals LM of (R+L)/2 / low rank side] 8 bits to 8 bits, respectively, and it is generated here.

[0088]In a low rank side, the digital audio signals expressed by this (R-L) / 2 the selection circuitry 64 Namely, when 8 bits can express, That is, when the digital audio signals expressed by (R-L)/2 do not overflow from 8 bits, the selected output of this synthetic digital-audio-signals DM is carried out.

[0089]In a low rank side, the digital audio signals expressed by this (R-L) / 2 On the other hand, when expression by 8 bits is difficult, That is, when the digital audio signals expressed by (R-L)/2 overflow from 8 bits, the selected output of the digital-audio-signals R of a right channel is carried out.

[0090]The bit manipulation part 61 assigns and outputs digital-audio-signals LS outputted from this selection circuitry 64 to the right channel in the conventional compact disk as digital audio signals of **.

[0091]In this optical disk recording device, disk original recording is exposed with the digital audio signals LM and LS of two channels outputted from this bit manipulation part 61. By this embodiment, digital audio signals are operated between channels by these, and the tone quality of digital audio signals is deteriorated.

[0092]Corresponding to this, like the compact disc player concerning an above-mentioned embodiment, a compact disc player obtains regenerative data, plays digital audio signals from this regenerative data, and outputs them to an external instrument from a compact disk. At this time, a compact disc player recovers the tone quality of digital audio signals by the bit manipulation part 65 shown in drawing 11.

[0093]That is, in the bit manipulation part 65, the digital audio signals LM and LS of two channels played from the compact disk are inputted into the comparison circuit 66, and it is judged whether 8 bits is [higher rank side of these digital audio signals LM and LS] in agreement here.

[0094]After the arithmetic circuit 67 receives these digital audio signals LM and LS of two channels and doubles the multiplication of the amplitude of the main digital audio signals LM, it is subtracted from digital-audio-signals LS of **. The digital audio signals expressed by (R-L)/2 overflow the arithmetic circuit 67 from 8 bits by this, When digital-audio-signals R of the right channel is assigned to digital-audio-signals LS of **, the digital audio signals showing left channel L are reproduced. The arithmetic circuit 67 outputs the digital audio signals which were carried out in this way and generated with digital-audio-signals LS of **.

[0095]The arithmetic circuit 68 receives these digital audio signals LM and LS of two channels, and adds and subtracts these two digital audio signals LM and LS. Thereby, the arithmetic circuit

67 reproduces the digital audio signals with which left channel L and right channel R are expressed, respectively, when the digital audio signals expressed to 8 bits of low ranks of digital-audio-signals LS of ** by $(R-L)/2$ are assigned.

[0096]The selection circuitry 64 carries out the selected output of the digital audio signals of two channels outputted from these two arithmetic circuits 67 and 68 based on the comparison result SEL of the comparison circuit 66. Namely, when 8 bits is [higher rank side of the digital audio signals LM and LS] in agreement, In this case, by assigning the digital audio signals which are expressed to 8 bits by $(R-L)/2$ as for the low rank side of digital-audio-signals LS of **, the selected output of the digital audio signals outputted from the selection circuitry 68 is carried out. On the other hand, by assigning the digital audio signals of the right channel to digital-audio-signals LS of ** in this case, when 8 bits is not [higher rank side of the digital audio signals LM and LS] in agreement, The selected output of the digital audio signals outputted from the selection circuitry 67 is carried out.

[0097]This compact disc player outputs the digital audio signals which were carried out in this way and quality recovered like a 1st embodiment.

[0098]Even if digital audio signals are operated between channels and it degrades tone quality like a 9th embodiment, the same effect as an above-mentioned embodiment can be acquired.

[0099](10) In the embodiment of ***** of the 10th operation, an optical disk recording device exposes the disk original recording 2 with the digital audio signals with which tone quality deteriorated like the optical disk recording device 1 concerning an above-mentioned embodiment. Furthermore, a bit is operated between channels and the tone quality of digital audio signals is degraded.

[0100]The digital audio signals expressed with this embodiment by $/(R+L) 2$, and $(R-L)/2$ like the case of a 9th above-mentioned embodiment at this time are generated. The digital audio signals furthermore expressed by $(R+L)/2$ among these digital audio signals of two channels are assigned to the conventional right and left channel, and are recorded. On the other hand, in the digital audio signals expressed by $(R-L)/2$, according to few things, data volume carries out a data compression, assigns a sub-code, and records on disk original recording.

[0101]An optical disk recording device operates digital audio signals between channels, degrades the quality of digital audio signals, enables it to perceive degradation of this quality further, and enables it to recover the quality which deteriorated by this.

[0102]Corresponding to this, like the compact disc player concerning an above-mentioned embodiment, a compact disc player obtains regenerative data, plays digital audio signals from this regenerative data, and outputs them to an external instrument from a compact disk. The data expressed by $/2$ from which a compact disc player is obtained from a sub-code $(R-L)$ at this time, Sequential-operation processing of the data expressed by $/2$ reproduced as digital audio signals $(R+L)$ is carried out, and this reproduces and outputs the digital audio signals of two channels.

[0103]Even if digital audio signals are operated between channels and it transmits data required for recovery of tone quality by a sub-code like a 10th embodiment, the same effect as an above-mentioned embodiment can be acquired.

[0104](11) In the embodiment of ***** of the 11th operation, as mentioned above about drawing 9, form recording area AR3 of attached data between read-out-area AR4 and user's area AR2. It replaces with the sub-code furthermore mentioned above about a 10th embodiment, and the digital audio signals expressed to recording area AR3 of this attached data by $(R-L)/2$ are recorded.

[0105]Corresponding to this, user's area AR2 and recording area AR3 of attached data are

accessed in simultaneous parallel by two optical pickups in a compact disc player. Or make one optical pickup repeat and seek, and user's area AR2 and recording area AR3 of attached data are accessed by turns, and the regenerative data obtained from each area AR2 and AR3 is buffered and outputted. Thereby, a compact disc player plays a compact disk so that the data expressed by $(R-L)/2$ and the data expressed by $(R+L)/2$ can be processed in simultaneous parallel. Sequential-operation processing of the data expressed by $1/(R-L)$ 2 furthermore reproduced and the data expressed by $(R+L)/2$ is carried out, and this reproduces and outputs the digital audio signals of two channels.

[0106]Even if digital audio signals are operated between channels and it transmits each of this operated channel individually like an 11th embodiment, the same effect as an above-mentioned embodiment can be acquired.

[0107](12) Although the case where made a 2-bit group into a unit and bit manipulation was carried out under a fixed rule in other embodiment, in addition 1st above-mentioned embodiment was described, Not only this but when a low rank side replaces each 8-bit bit by a prescribed rule when carrying out bit manipulation of this invention, for example by bit flipping, and carrying out bit manipulation, it can be applied widely.

[0108]Although the tone quality of digital audio signals was degraded with the key data which is additional data and the case where this attached data was recorded on the periphery side of a compact disk was described in a 3rd above-mentioned embodiment, This invention may record not only this but the data etc. which transmit the significant information relevant to a compact disk, for example, and may degrade the tone quality of digital audio signals by the logical operation between these data and digital audio signals. As data which transmits this kind of significant information in this case, the text data which shows an owner of a copyright, the text data of words, the image data of a jacket, the HTML data to which it shows related works, etc. are applicable.

[0109]With the data which transmits this significant information in a compact disc player corresponding to this, the information about a compact disk can be displayed and tone quality can be recovered using this data. Furthermore, it may encipher separately and this significant data recorded on the periphery side in these cases may be recorded.

[0110]Although the case where degraded the tone quality of these 18-bit digital audio signals, and it was recorded by a low rank side's carrying out the data compression of the 8 bits, and a higher rank side compounding with 10 bits from 18-bit digital audio signals in a 4th above-mentioned embodiment was described, As for this invention, a higher rank side 20-bit digital audio signals in addition to this, for example 16 bits, A low rank side decomposes into 4-bit digital audio signals, and this low rank side records 4-bit digital audio signals on the periphery side of a compact disk, and. The 16-bit low rank side of digital audio signals may degrade the tone quality of digital audio signals by the logical operation of 4 bits and the 4-bit digital audio signals recorded on this periphery side. If it does in this way, in the special-purpose machine which plays this compact disk, digital audio signals can be outputted by high-quality sound much more by performing processing corresponding to the processing which degraded this tone quality.

[0111]Although many of the above-mentioned embodiments described the case where as for the low rank side of digital audio signals carry out bit manipulation, and degraded the tone quality of digital audio signals, and it was recovered about 8 bits, even if the number of bits which carries out bit manipulation of this invention not only this but if needed can be set as versatility and carries out bit manipulation only of 6 bits, 4 bits, 2 etc. bits, etc. of the predetermined bits of

digital audio signals, it can acquire the same effect.

[0112]Although this invention was applied to the compact disk and the case where degraded the tone quality of the digital audio signals which only quantize a sampling value, and it was recovered was described in the above-mentioned embodiment, Even if it makes it this invention recover not only this but the tone quality which degraded [apply, for example to a mini disc and] the tone quality of the digital audio signals which carried out the data compression and deteriorated, it can acquire the same effect as an above-mentioned embodiment. The digital audio signals which carry out a data compression in this case, By being constituted with the data in which the coefficient data in which frequency spectra are shown, and a profit are shown, digital audio signals can be operated in the direction of a frequency axis, and tone quality can be degraded simply, and the tone quality which deteriorated can be recovered.

[0113]Although the case where the tone quality which operated the predetermined bit which is a fixed rate to all the bits of digital audio signals, degraded tone quality in the above-mentioned embodiment, and deteriorated again was recovered was described, This invention may change not only this but this number of bits to operate according to the amplitude of digital audio signals, and, thereby, may change the grade to degrade and the grade to recover according to digital audio signals. It may replace with this, the number of bits operated with a time code etc. may be changed, and, thereby, the grade of degradation and the grade to recover may be changed.

[0114]According to digital audio signals, the grade to degrade and the grade to recover may be changed by furthermore changing the number of bits operated in these cases according to distribution of the peak value of digital audio signals, a dynamic range, and frequency spectra, etc. if it does in this way, various tone quality degradation on the audibility which changes with sauce can be boiled and operated.

[0115]The same effect can be acquired even if it changes the number of bits operated by the genre of sauce in these cases. That is, for example, the piano solo of classic music can make tone quality degradation perceive certainly, even if a dynamic range lessens the number of bits in which a signal level falls and carries out bit manipulation extremely in a portion with small volume greatly. On the other hand, if it is in pop etc., also in a portion with a comparatively small dynamic range and small volume, there is the feature that reduction in signal level is comparatively small. If it is in pop etc. by this, the number of bits which carries out bit manipulation as compared with a piano solo etc. can be increased, and tone quality degradation can be made to perceive to the same extent as cases, such as a piano solo.

[0116]Recovered tone quality thoroughly, outputted digital audio signals, in the above-mentioned embodiment, when copyright was able to be protected certainly, when other, described the case where it outputted without recovering tone quality in any way, but. This invention may change the grade of tone quality degradation not only according to this but according to an external instrument. That is, when outputting digital audio signals to the external instrument by the conventional SCMS in a 1st above-mentioned embodiment in this case, the case where only 12 bits is outputted by right digital value among 16 bits etc. can be considered.

[0117]As shown in drawing 12 in these cases, apparatus ID may be acquired from the external instrument 70 connected by IEEE1394 etc., and the tone quality of digital audio signals may be degraded according to an external instrument by the bit manipulation on the basis of this apparatus ID. In the bit manipulation part 72 by the side of the compact disc player 71, bit manipulation is carried out by encryption in this case, and it is made to degrade the tone quality of digital-audio-signals DM incidentally.

[0118]On the other hand, in the external instrument 70, in a recording system, it constitutes so that it can record without carrying out bit manipulation of the inputted digital audio signals in any way, and the bit manipulation part which recovers the quality of digital audio signals on the basis of apparatus ID of this external instrument is arranged to a reversion system.

[0119]If it does in this way, it can set up so that digital audio signals can be reproduced by high-quality sound, only when reproducing with this external instrument 70, and only a private copy can be enjoyed by high-quality sound. Illegal distribution of the recording medium which this copied with this external instrument 70 can be prevented.

[0120]Contrary to these, apparatus ID acquired from the apparatus of the transmission destination of digital audio signals is judged, For example, only when outputting digital audio signals to apparatus like the mini disc device united with the compact disc player, the tone quality of digital audio signals is recovered and it is made to output.

[0121]Tone quality is degraded on the basis of apparatus ID of self, and the digital audio signals inputted by high-quality sound are recorded, and it is made to recover the tone quality of the reproduced digital audio signals on the basis of apparatus ID of self in this unified apparatus at this time. Even if it does in this way, it can make it possible to enjoy itself by high-quality sound only about a private copy, and illegal distribution of the copied recording medium can be prevented.

[0122]Although the case where tone quality was degraded in a further above-mentioned embodiment about the digital audio signals recorded on a compact disk was described, This invention is widely applicable to optical disk units which unified the record reproduction system, such as not only this but a mini disc device, a digital audio tape recorder, etc. Not only in when outputting and inputting digital audio signals between external instruments in this case, The duplicate of those other than the private purpose can be remarkably restricted by deteriorating, making it recover tone quality, also when carrying out record reproduction of the digital audio signals to a recording medium, and performing degradation of the tone quality at the time of this record reproduction, and recovery on the basis of apparatus ID of each apparatus, a serial number, etc.

[0123]Although the case where tone quality was degraded in a further above-mentioned embodiment about the digital audio signals recorded on a compact disk was described, This invention can be widely applied, not only this but when transmitting digital audio signals, for example via digital satellite broadcasting, the Internet, etc.

[0124]In an above-mentioned embodiment, although the case where digital audio signals were transmitted was described, this invention can be widely applied, when transmitting various digital signals, such as not only this but the Digital Video signal.

[0125]

[Effect of the Invention]So that quality may deteriorate according to this invention as mentioned above to such an extent that it can perceive, And by operating and transmitting a digital signal, a digital signal can be transmitted also to a conventional machine machine, and copyright can be effectively protected so that the quality which deteriorated by predetermined processing can be recovered.

CLAIMS

[Claim(s)]

[Claim 1]Transmission equipment of a digital signal characterized by comprising the following.
A quality degradation means to degrade quality of an input digital signal and to generate a digital signal of quality degradation so that degradation of quality can be perceived, and so that quality which deteriorated can be recovered.

A transmission means which transmits a digital signal of said quality degradation.

[Claim 2]Transmission equipment of the digital signal according to claim 1, wherein said quality degradation means operates said input digital signal to an amplitude direction and generates a digital signal of said quality degradation.

[Claim 3]Transmission equipment of the digital signal according to claim 2, wherein said quality degradation means operates a predetermined bit of said input digital signal and operates said input digital signal to an amplitude direction.

[Claim 4]Transmission equipment of the digital signal according to claim 2, wherein said quality degradation means operates a predetermined bit of said input digital signal with a digital signal which degrades quality and operates said digital signal to an amplitude direction.

[Claim 5]Transmission equipment of the digital signal according to claim 2, wherein said quality degradation means operates a predetermined bit of said input digital signal with data which degrades quality and operates said digital signal to an amplitude direction.

[Claim 6]Transmission equipment of the digital signal according to claim 5, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 7]Transmission equipment of the digital signal according to claim 1, wherein said quality degradation means operates said input digital signal to a time base direction and generates a digital signal of said quality degradation.

[Claim 8]Transmission equipment of the digital signal according to claim 7 with which said quality degradation means is characterized by a thing of said input digital signal for which a bit is changed to a time base direction in part at least, and said input digital signal is operated to a time base direction.

[Claim 9]Transmission equipment of the digital signal according to claim 1, wherein said quality degradation means operates said input digital signal in the direction of a frequency axis and generates a digital signal of said quality degradation.

[Claim 10]Transmission equipment of the digital signal according to claim 9, wherein said input digital signal is a digital signal by which the data compression was carried out.

[Claim 11]Transmission equipment of the digital signal according to claim 1, wherein said input digital signal is a digital signal of two or more channels, and said quality degradation means operates said input digital signal between channels and generates a digital signal of said quality degradation.

[Claim 12]Transmission equipment of the digital signal according to claim 1, wherein said quality degradation means degrades quality of said input digital signal with a predetermined cycle.

[Claim 13]Transmission equipment of the digital signal according to claim 1, wherein said quality degradation means changes a grade which degrades quality according to said input digital signal.

[Claim 14]Transmission equipment of the digital signal according to claim 1, wherein said quality degradation means changes a grade which degrades quality according to a transmission object of said transmission means.

[Claim 15]Transmission equipment of the digital signal according to claim 1, wherein said transmission means transmits separately data required to recover quality of a digital signal of said quality degradation.

[Claim 16]Transmission equipment of the digital signal according to claim 15, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 17]Transmission equipment of the digital signal according to claim 1 replacing said transmission means with a digital signal of said quality degradation according to a transmission object, and transmitting said input digital signal.

[Claim 18]Transmission equipment of the digital signal according to claim 1 said transmission means's recording a digital signal of said quality degradation on an optical disc, and transmitting a digital signal of said quality degradation.

[Claim 19]Said transmission means records a digital signal of said quality degradation on an optical disc, and a digital signal of said quality degradation is transmitted, Transmission equipment of the digital signal according to claim 1 recording data required to recover quality of a digital signal of said quality degradation on said optical disc, and transmitting it.

[Claim 20]Transmission equipment of the digital signal according to claim 19, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 21]A transmission method of a digital signal degrading quality of an input digital signal, generating a digital signal of quality degradation, and transmitting a digital signal of said quality degradation so that degradation of quality can be perceived, and so that quality which deteriorated can be recovered.

[Claim 22]A transmission method of the digital signal according to claim 21 operating said input digital signal to an amplitude direction, and generating a digital signal of said quality degradation.

[Claim 23]A transmission method of the digital signal according to claim 22 operating a predetermined bit of said input digital signal, and operating said input digital signal to an amplitude direction.

[Claim 24]A transmission method of the digital signal according to claim 22 operating a predetermined bit of said input digital signal with a digital signal which degrades quality, and operating said digital signal to an amplitude direction.

[Claim 25]A transmission method of the digital signal according to claim 22 operating a predetermined bit of said input digital signal with data which degrades quality, and operating said digital signal to an amplitude direction.

[Claim 26]A transmission method of the digital signal according to claim 25, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 27]A transmission method of the digital signal according to claim 21 operating said input digital signal to a time base direction, and generating a digital signal of said quality degradation.

[Claim 28]A transmission method of the digital signal according to claim 27 characterized by a thing of said input digital signal for which a bit is changed to a time base direction in part at least, and said input digital signal is operated to a time base direction.

[Claim 29]A transmission method of the digital signal according to claim 21 operating said input digital signal in the direction of a frequency axis, and generating a digital signal of said quality degradation.

[Claim 30]A transmission method of the digital signal according to claim 29, wherein said input digital signal is a digital signal by which the data compression was carried out.

[Claim 31]A transmission method of the digital signal according to claim 21, wherein said input

digital signal is a digital signal of two or more channels, and a transmission method of said digital signal operates said input digital signal between channels and generates a digital signal of said quality degradation.

[Claim 32] A transmission method of the digital signal according to claim 21 degrading quality of said input digital signal with a predetermined cycle.

[Claim 33] A transmission method of the digital signal according to claim 21 changing a grade which degrades quality according to said input digital signal.

[Claim 34] A transmission method of the digital signal according to claim 21 changing a grade which degrades quality according to a transmission object of said transmission means.

[Claim 35] A transmission method of the digital signal according to claim 21 transmitting separately data required to recover quality of a digital signal of said quality degradation.

[Claim 36] A transmission method of the digital signal according to claim 35, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 37] A transmission method of the digital signal according to claim 21 replacing with a digital signal of said quality degradation, and transmitting said input digital signal according to a transmission object.

[Claim 38] A transmission method of the digital signal according to claim 21 recording a digital signal of said quality degradation on an optical disc, and transmitting a digital signal of said quality degradation.

[Claim 39] A transmission method of the digital signal according to claim 21 recording a digital signal of said quality degradation on an optical disc, transmitting a digital signal of said quality degradation, recording data required to recover quality of a digital signal of said quality degradation on said optical disc, and transmitting it.

[Claim 40] A transmission method of the digital signal according to claim 39, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 41] Transmission equipment of a digital signal characterized by comprising the following. A transmission means which inputs a digital signal of quality degradation which quality deteriorates and becomes so that degradation of quality can be perceived, and so that quality which deteriorated can be recovered from a predetermined transmission line.

A quality recovery means which recovers quality of a digital signal of said quality degradation.

[Claim 42] Transmission equipment of the digital signal according to claim 41, wherein said quality recovery means operates a digital signal of said quality degradation to an amplitude direction and recovers quality of a digital signal of said quality degradation.

[Claim 43] Transmission equipment of the digital signal according to claim 42, wherein said quality recovery means operates a predetermined bit of a digital signal of said quality degradation and operates a digital signal of said quality degradation to an amplitude direction.

[Claim 44] Transmission equipment of the digital signal according to claim 42, wherein said quality recovery means operates a predetermined bit of a digital signal of said quality degradation with a digital signal which recovers quality and operates a digital signal of said quality degradation to an amplitude direction.

[Claim 45] Transmission equipment of the digital signal according to claim 42, wherein said quality recovery means operates a predetermined bit of a digital signal of said quality degradation with data which recovers quality and operates a digital signal of said quality degradation to an amplitude direction.

[Claim 46] Transmission equipment of the digital signal according to claim 45, wherein said data

is data which transmits significant information relevant to said digital signal.

[Claim 47]Transmission equipment of the digital signal according to claim 41, wherein said quality recovery means operates a digital signal of said quality degradation to a time base direction and recovers quality of a digital signal of said quality degradation.

[Claim 48]Transmission equipment of the digital signal according to claim 47 with which said quality recovery means is characterized by a thing of a digital signal of said quality degradation for which a bit is changed to a time base direction in part at least, and a digital signal of said quality degradation is operated to a time base direction.

[Claim 49]Transmission equipment of the digital signal according to claim 41, wherein said quality recovery means operates a digital signal of said quality degradation in the direction of a frequency axis and recovers quality of a digital signal of said quality degradation.

[Claim 50]Transmission equipment of the digital signal according to claim 49, wherein a digital signal of said quality degradation is a digital signal by which the data compression was carried out.

[Claim 51]Transmission equipment of the digital signal according to claim 41, wherein a digital signal of said quality degradation is a digital signal of two or more channels, and said quality recovery means operates a digital signal of said quality degradation between channels and recovers quality of a digital signal of said quality degradation.

[Claim 52]Transmission equipment of the digital signal according to claim 41, wherein said quality recovery means recovers quality of a digital signal of said quality degradation with a predetermined cycle.

[Claim 53]Transmission equipment of the digital signal according to claim 41, wherein said quality recovery means recovers quality of a digital signal of said quality degradation according to a digital signal of said quality degradation.

[Claim 54]Transmission equipment of the digital signal according to claim 41 outputting selectively a digital signal which recovered said quality, and a digital signal of said quality degradation to said external instrument according to an external instrument.

[Claim 55]Transmission equipment of the digital signal according to claim 41, wherein it sends out a digital signal which recovered said quality to an external instrument and said quality recovery means changes a grade of quality to recover according to said external instrument.

[Claim 56]Transmission equipment of the digital signal according to claim 41, wherein said transmission means inputs separately data required to recover quality of a digital signal of said quality degradation.

[Claim 57]Transmission equipment of the digital signal according to claim 56, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 58]Transmission equipment of the digital signal according to claim 41, wherein said transmission means is a reversion system which plays a digital signal of said quality degradation from an optical disc.

[Claim 59]Transmission equipment of the digital signal according to claim 41, wherein said transmission means is a reversion system which plays data more nearly required than an optical disc to recover quality of a digital signal of said quality degradation, and a digital signal of said quality degradation.

[Claim 60]A transmission method of a digital signal inputting a digital signal of quality degradation which quality deteriorates and becomes from a predetermined transmission line, and recovering quality of a digital signal of said quality degradation so that degradation of quality can be perceived, and so that quality which deteriorated can be recovered.

[Claim 61] A transmission method of the digital signal according to claim 60 operating a digital signal of said quality degradation to an amplitude direction, and recovering quality of a digital signal of said quality degradation.

[Claim 62] A transmission method of the digital signal according to claim 61 operating a predetermined bit of a digital signal of said quality degradation, and operating a digital signal of said quality degradation to an amplitude direction.

[Claim 63] A transmission method of the digital signal according to claim 61 operating a predetermined bit of a digital signal of said quality degradation with a digital signal which recovers quality, and operating a digital signal of said quality degradation to an amplitude direction.

[Claim 64] A transmission method of the digital signal according to claim 61 operating a predetermined bit of a digital signal of said quality degradation with data which recovers quality, and operating a digital signal of said quality degradation to an amplitude direction.

[Claim 65] A transmission method of the digital signal according to claim 64, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 66] A transmission method of the digital signal according to claim 60 operating a digital signal of said quality degradation to a time base direction, and recovering quality of a digital signal of said quality degradation.

[Claim 67] A transmission method of the digital signal according to claim 66 characterized by a thing of a digital signal of said quality degradation for which a bit is changed to a time base direction in part at least, and a digital signal of said quality degradation is operated to a time base direction.

[Claim 68] A transmission method of the digital signal according to claim 60 operating a digital signal of said quality degradation in the direction of a frequency axis, and recovering quality of a digital signal of said quality degradation.

[Claim 69] A transmission method of the digital signal according to claim 68, wherein a digital signal of said quality degradation is a digital signal by which the data compression was carried out.

[Claim 70] A digital signal of said quality degradation is a digital signal of two or more channels, and a transmission method of said digital signal, A transmission method of the digital signal according to claim 60 operating a digital signal of said quality degradation between channels, and recovering quality of a digital signal of said quality degradation.

[Claim 71] A transmission method of the digital signal according to claim 60 recovering quality of a digital signal of said quality degradation with a predetermined cycle.

[Claim 72] A transmission method of the digital signal according to claim 60 characterized by recovering quality of a digital signal of said quality degradation according to a digital signal of said quality degradation.

[Claim 73] A transmission method of the digital signal according to claim 60 outputting selectively a digital signal which recovered said quality, and a digital signal of said quality degradation to said external instrument according to an external instrument.

[Claim 74] A transmission method of the digital signal according to claim 60 changing a grade of quality which sends out a digital signal which recovered said quality to an external instrument, and is recovered according to said external instrument.

[Claim 75] A transmission method of the digital signal according to claim 60 inputting separately data required to recover quality of a digital signal of said quality degradation.

[Claim 76] A transmission method of the digital signal according to claim 75, wherein said data is

data which transmits significant information relevant to said digital signal.

[Claim 77] A transmission method of the digital signal according to claim 60, wherein said transmission line has an optical disc, and a transmission method of said digital signal plays a digital signal of said quality degradation and inputs a digital signal of said quality degradation from said optical disc.

[Claim 78] Have said transmission line and an optical disc a transmission method of said digital signal, A transmission method of the digital signal according to claim 60 playing data required to recover quality of a digital signal of said quality degradation, and a digital signal of said quality degradation, and inputting a digital signal and said data of said quality degradation from said optical disc.

[Claim 79] A transmission method of the digital signal according to claim 78, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 80] A recording medium of a digital signal recording a digital signal of quality degradation which makes quality come to deteriorate so that quality which has perceived degradation of quality and deteriorated can be recovered.

[Claim 81] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation operated a predetermined digital signal to an amplitude direction and is generated.

[Claim 82] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation operated a predetermined bit of a predetermined digital signal and is generated.

[Claim 83] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation operated a predetermined bit of a predetermined digital signal with a digital signal which degrades quality and is generated.

[Claim 84] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation operated a predetermined bit of a predetermined digital signal with data which degrades quality and is generated.

[Claim 85] A recording medium of the digital signal according to claim 84, wherein said data is data which transmits significant information relevant to said digital signal.

[Claim 86] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation operated a predetermined digital signal to a time base direction and is generated.

[Claim 87] A recording medium of the digital signal according to claim 80 with which a digital signal of said quality degradation is characterized by a thing of a predetermined digital signal which a bit was changed to a time base direction in part at least, and was generated.

[Claim 88] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation operated a predetermined digital signal in the direction of a frequency axis and is generated.

[Claim 89] A recording medium of the digital signal according to claim 88, wherein a digital signal of said quality degradation is a digital signal by which the data compression was carried out.

[Claim 90] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation operated a digital signal of two or more channels between channels and is generated.

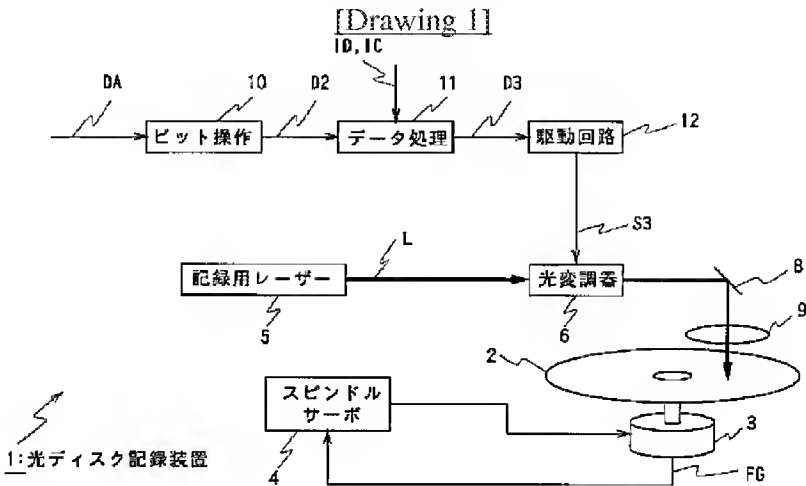
[Claim 91] A recording medium of the digital signal according to claim 80, wherein a digital signal of said quality degradation degraded quality of a predetermined digital signal in a given

period and is generated.

[Claim 92]A recording medium of the digital signal according to claim 80 recording data required to recover quality of a digital signal of said quality degradation.

[Claim 93]A recording medium of the digital signal according to claim 92, wherein said data is data which transmits significant information relevant to said digital signal.

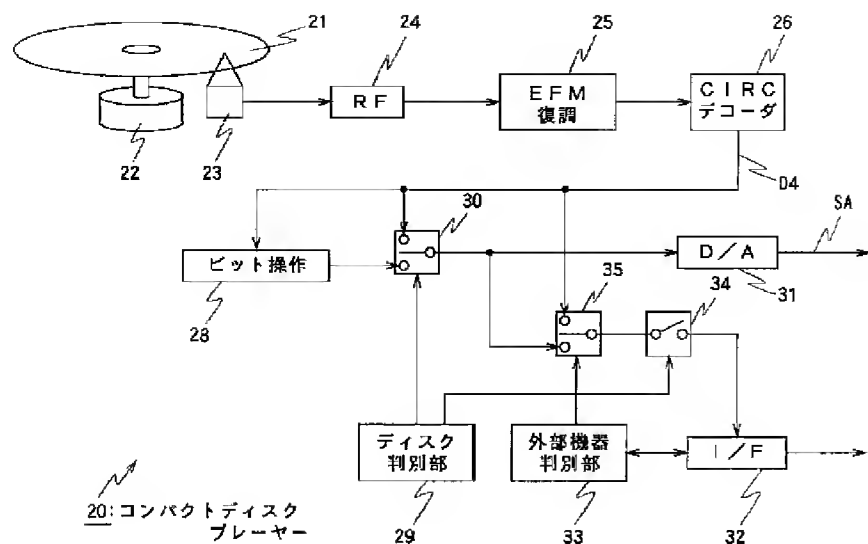
DRAWINGS



[Drawing 2]

入力	出力
0 0	1 1
0 1	1 0
1 0	0 0
1 1	0 1

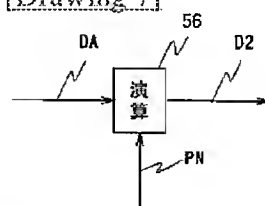
[Drawing 3]



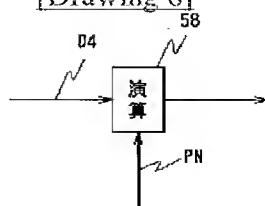
[Drawing 4]

プレーヤー	ディスク	アナログ信号による再生音質	PC上でのコピー
CDプレーヤー (従来機種)	CDディスク	CD音質	CD音質
	ECDディスク	FM音質	FM音質
ECDプレーヤー (新機種)	CDディスク	CD音質	CD音質
	ECDディスク	CD音質	FM音質 (従来PC) CD音質 (二次コピー禁止PC)

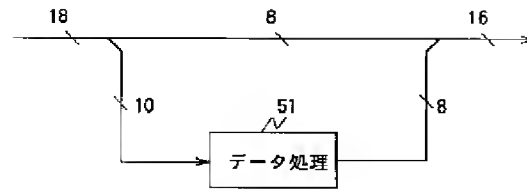
[Drawing 7]



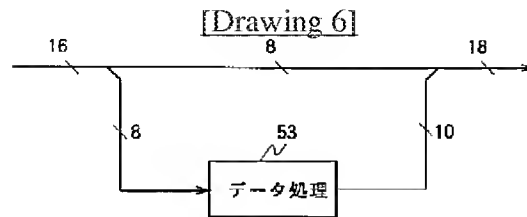
[Drawing 8]



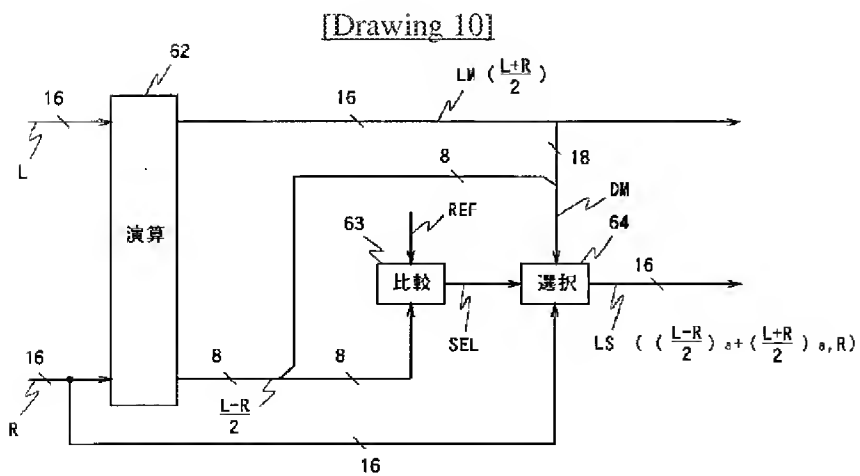
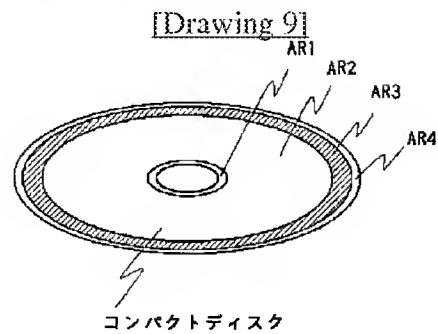
[Drawing 5]



50: ビット操作部

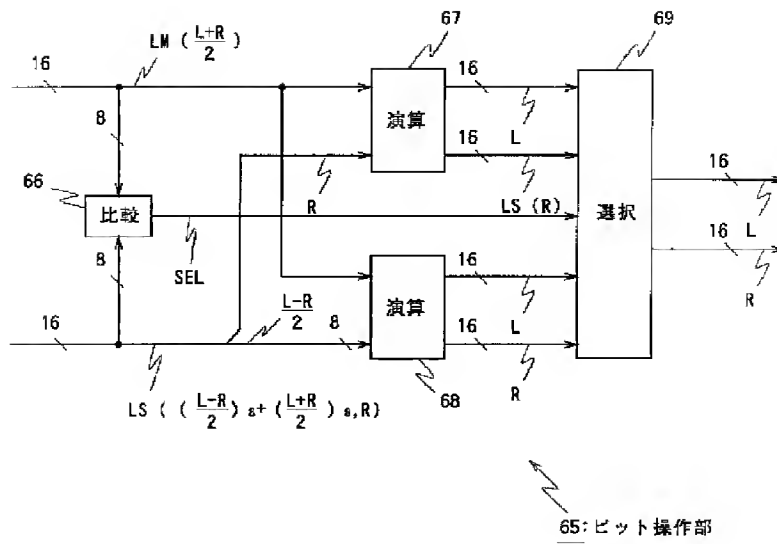


52: ビット操作部



61: ビット操作部

[Drawing 11]



[Drawing 12]

